

**Comments of**  
**Gary M. Hartsog, PE & PS, before the**  
**Technical Study Panel on the Utilization of Belt Air**  
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Good Afternoon, my name is Gary Hartsog. I am the president of Alpha Engineering located in Beckley, West Virginia. Alpha Engineering is an engineering consulting firm that has provided engineering services to the mining industry for the past 16 years. Our work is mainly in deep coal mines dealing with mine design, ventilation, mapping and system design. I am a registered professional engineer and surveyor and a graduate of West Virginia University with BS degrees in Education and Mining Engineering and Master's degrees in Mining Engineering and Business Administration. I have been involved for over 30 years in designing and operating coal mines for the safe and efficient mining of coal. For 15 of those years I worked at longwall mines, many using belt air in the working faces. I have helped develop the 101(c) Petitions for Modification and help today administer ventilation plans and systems to use belt air in the working faces.

I greatly appreciate the opportunity to stand before this distinguished Panel today to present some of my experiences and thoughts concerning the use of belt air in the working faces and use our clients' experiences as examples.

My purpose here today is to offer this Panel comments on how the use of air that has been used to ventilate conveyor belt entries is important, sometimes critical, to the coal mining industry. For many years there was a prohibition against using belt air to ventilate the working faces. As technology developed, improved and become more dependable, Belt Air was allowed to be used to ventilate working faces so long as there was a heightened vigilance against fires in the conveyor belt entries.

Belt air is not necessary to ventilate the working faces every coal mine in the US. In fact, there are relatively few underground mines that need to use Belt Air in the face. In many coal mines that use belt air to ventilate the working faces, it is generally a very important component to providing a safe and healthful working environment by providing additional airflows, allowing greater pressures to be used in ventilating gobs and other improvements in augmenting the safe operation of the mine. I would list these mines in the categories as follows. This is not an exhaustive list and it emphasizes mainly the eastern coal fields leaving some of the special circumstances of the western coal fields, like two entry development, for others to address.

**First**, there is the development for longwalls. Longwall gate development consists of driving a three or four entry panel for some distance until a block of coal has been isolated for mining with the longwall. Some of our clients develop gates that are in the 10,000 to 18,000 foot deep range. Since these gate-roads can become quite long they become difficult to ventilate, especially if there is significant methane liberation. The use of belt air in the working face allows the leakage to be minimized between the intake and the belt entry and therefore deliver more air to the working faces. Let's say that we have a three entry panel where the air is coursed up the intake (usually No. 2 entry) and a split of the air ventilates the working face while another split ventilates the belt outby to the mains. (See Sketch A). As the air flows outby in the return and belt entries, the increasing pressure differential results in the increase of leakage from the intake to the other two entries. In some cases, the intake to the section may be over 100,000 CFM at the section mouth and, due to leakage, less than 15 to 25,000 CFM may reach the split point. That would not be adequate flow to ventilate both the belt entries and the faces. If the belt air is allowed to be used in the faces, the flow of the belt entry air is in the same direction as the intake and the pressure differentials are minimized. (See Sketch B). Under this scenario, there can be significantly more, maybe double or triple, the air reaching the face. Therefore the belt entry and the faces are both ventilated with greater, safer and more desirable quantities of air.

**Second**, there are those mines who need maximum air flow for the purpose of diluting and carrying away methane. This can be a longwall or a room-and-pillar mine. In deep mines, especially where there is split or fish-tail ventilation, it is necessary to get large quantities of air to the faces for methane dilution and control of respirable dust. Due to haulage and supply constraints and requirements in the faces, it is not unusual for there to be as many as three or four haulage or belt air entries in mains or panels. These entries must be adequately ventilated to prevent stratification of methane, for the belt conveyor as well as for any diesel equipment that may be in use. When belt air is not used in the faces, significant return capacity is used on the section just to ventilate the haulage and belt conveyor entries. This reduces the amount of airflow available for the face operation. In addition, when this belt/haulage air is not used to ventilate the faces, it is more difficult to ventilate two continuous miners operating using split ventilation because of the additional distance the air must be conveyed to the far end of the working section by curtains: the air tends to leak into the belt/haulage entries and to the return rather than traveling to the faces. (See Sketches C & D).

**Third**, there are those mines where distances and pressure differentials required for ventilating gob areas on second mining makes it extremely difficult to make the belt air go outby to another return. This can be in either a room-and-pillar or longwall mine. (See Sketch E). There are many cases where the pressure requirements to keep the gob adequately ventilated are so great that the air, once it goes to the section loading point, cannot be induced to travel outby to the mains in the belt entries. For example, in a longwall, if adequate pressure to pull the belt air outby to the main returns were available, the leakage from the intakes to the belts would be so great that inadequate airflows would reach the working section. In another example, in many second mining situations it is advantageous to make all the entries leading to the working faces intake so that all the air will go through and/or around the gob. (See Sketches F & G). This helps with allaying respirable dust and makes the ventilation at the section simpler. It also delivers more air to the working section. It eliminates the potential for air from the gob to pull out into the working section. All of these are significant safety features when ventilating a unit on second mining and ventilating an active gob.

**Fourth**, there are those mines in the early development stages between 30 CFR Part 77 and 30 CFR Part 75. When a mine is starting from a slope or shaft bottom into a virgin area, those first developing areas are very hard to ventilate. Invariably, there is a “gray” area between the end of Part 77 – which applies to shaft and slope development – and Part 75 – which applies to normal mine development. In order to move from Part 77 to Part 75 as quickly as practical, some mines use belt air in the faces for this period of time and then switch to a permanent ventilation system that does not use belt air to ventilate the working faces. The reason for using belt air in these situations is that the mine is typically on smaller, temporary fans with limited delivery capabilities such as tubing or small boreholes until all the mine openings are connected and the main ventilation system placed in service. In these cases, every bit of airflow is needed in the faces because of the limited flows that are available. As more US coal mines are developed below drainage, this approach to starting a new mine will become more important.

**Fifth**, additional quantities of airflow cannot always be met by driving additional entries. For example, the number of entries in may be limited by ground control concerns such as deep overburden, use of yield pillars or multiple seam (i.e. under and/or over mining) mining that result in heavy stress zones. In those cases, overall mains or panel widths cannot be increased due to safety concerns for roof falls during advance and outbursts and abutment falls during retreat mining – so a limited number of entries must use a small corridor between stress zones. Other cases also occur where the number of entries must be limited. For example when working in low- cover areas and when mining around and in the vicinity of old workings.

**In conclusion**, not every mine will use belt air to ventilate the working faces. However, to some mines it is very important that this method of ventilation be available for the safe, systematic mining of coal. It is obvious from the previous examples that the use of belt air in the faces is more prevalent in the deeper mines that develop greater distances or must handle higher levels of methane. However, there are also other mines that need the belt air option where the number of entries is limited by over and under mining and

other factors. The technology for detecting hot-spots or fires in conveyor belt entries has made huge advances since it was first introduced in the 1970's. In fact, CO monitoring systems for belt air monitoring have been the backbone for much of the mine monitoring, tracking, communications and data systems in development and use today. That technology today is a tool that allows operations managers, design engineers and safety professionals to be confident in design, support and operation of mines where belt air is used in the faces.

The use of belt air in the faces is not for every mine. It is, however, an extremely important tool and option that needs to be freely available, with proper monitoring and safeguards, for all mines and most especially for those mines with the more difficult conditions and greater distances to ventilate.







